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STRATEGIC VISION: PRECISION GUIDANCE TO THE CENTER OF GRAVITY

by

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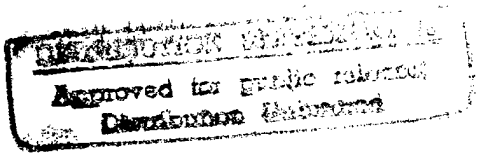
A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of Joint Military Operations.

The contents of this paper reflects my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.



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Abstract of

STRATEGIC VISION: PRECISION GUIDANCE TO THE CENTER OF GRAVITY

A new American way of war has evolved over the years—one that uses technology as leverage to decisively attack the enemy's strategic or operational center of gravity while minimizing casualties, collateral damage, and national resources expended. This new way of war has been incorporated into Joint Vision 2010, the Joint Chiefs of Staff's strategic vision, as well as the four services' strategic visions. These visions are focusing on precision guided munitions as one of the primary sources of technology giving the combatant commanders the capability to indirectly and decisively strike the enemy's center of gravity, while achieving the unwritten goals of the new American way of war. The combatant commander will be able to feasibly and acceptably attack the center of gravity by eliminating key operational nodes that will make the center of gravity vulnerable to direct attacks. The commander will also be able to positively affect time, space, and force of the battlespace through simultaneity and tempo. The use of precision munitions alone will not allow the commander to win the war. He will have to proactively build a robust intelligence community that is able to have highly detailed intelligence both before the first strike of the operation is launched and after the mission for battle damage assessment. Without this detailed intelligence, any efficiency the commander hopes to be realized by using precision munitions will be lost. The commander will also have to be familiar with the weapons weather constraints, cost considerations of the weapon, and above all, remember that this new capability is only part of the complete arsenal the commander should use.

INTRODUCTION

Have our lessons from the most recent U.S. led operations handcuffed the combatant commanders in how they will fight their next war? The success of offensive air operations in Operations DESERT STORM and DELIBERATE FORCE has caused the U.S. military visionaries to give more credence to greater use of technology, especially precision guided munitions (PGM), to gain the upper hand in the next war. What has the successfulness of precision munitions done to the operational commanders' options? Are they still combatant commanders or just puppets to technology?

The Joint Chiefs of Staff (JCS) and the four services' strategic vision statements focus on precision guided weapons technology as a source of leverage. This doctrinal expectation of precision munitions has given the combatant commander the capability to decisively strike the enemy's center of gravity (CoG), with simultaneity and increased operational tempo, while minimizing casualties, collateral damage, and national resources expended. This effective and efficient leverage is contingent upon the operational commander having outstanding intelligence, a complete grasp on the limitations of the technology, and the realization that the precision weapon will not win the war by itself.

The military vision statements have evolved their increased dependence on technology and PGMs, largely because of a new American way of war. The American national strategy in conducting wars has changed over the past 220 years. It has evolved from an attrition strategy, to an annihilation strategy, to one of limited aims, and finally to one that embodies

itself in technology to increase lethality, while at the same time decreasing the costs associated with destruction. The new American way of war is being embedded into the strategic vision statements of the JCS and the services; they all contain similar guidance to decisively attack the enemy's CoG with the least force possible.

This change in war, and consequently the future vision of the U.S. military services, has increased the combatant commanders dependence on the use of PGMs. A recurring capability mentioned in these strategic visions is to attack the enemy at his CoG with precise operational fires, thus increased lethality, through effects-oriented firepower versus massive firepower. This capability will greatly enhance the commander's ability to reduce the number of weapons and manpower required to decisively win an operation, campaign, or war. If the CoG is not vulnerable to direct operational fires, then the commander can attack indirectly by eliminating key operational nodes that will make the CoG vulnerable.[a] By capitalizing on the effects of PGMs, the commander will positively affect the time, space, and force of the battlespace through simultaneity and tempo. When the commander uses PGMs, he will inherit problems that must be proactively addressed, such as the need for more exact intelligence, the great impact of the weather on the weapon system, and the pit-fall of over relying on PGMs.

[a] **Vulnerabilities** are an enemy's critical weakness that can be attacked directly and will have a direct impact on the enemy's center of gravity. This definition is synthesized from "Elements of Operational Warfare," written by the Naval War College Joint Military Operations Department, August, 1996.

THE NEW AMERICAN WAY OF WAR

The way in which Americans fight wars has changed. During the American Revolutionary War, the Continental Army's way of war was one of attrition. Because the American forces could not win a toe-to-toe musket volley war, General Washington found it more prudent to use a defensive strategy that attrited the British forces while maximizing the American's resources and limited firepower. In little less than a century later, the pendulum of the American way of war had swung to the other extreme—annihilation. During the American Civil War, the bloodiest war in American history, the opposing forces would engage each other in a symmetric manner[b] trying to win the decisive battle. They fought until one side was slaughtered or retreated in defeat. World War II continued this annihilistic American way of war; however, this time the United States used technology to increase their firepower. The huge American industrial machine, which was unrivaled by any other country in the world, built war supplies faster than any of the belligerents. Later, the American way of war grossly changed as the Cold War emerged and the United States participated in two far east conflicts, Korea and Vietnam. The United States no longer focused on the complete annihilation of the enemy, but limited aims to reduce the chance of escalation, both in forces and types of weapons used. At the same time and for the first time, almost real-time color news footage was being brought into every American's living room by the television. The new desire was to limit the loss of American lives, and limit needless noncombatant killings and the destruction of property.

[b] Committing similar forces against each other; infantry vs. infantry, cavalry vs. cavalry, or ship vs. ship

As we approach the first millennium of modern times, a new American way of war has emerged. American military leaders have learned from history. The new American way of war is one that capitalizes on technologies and is characterized by being quick, decisive, and minimizing casualties while expending the least national resources to gain the maximum effect. To accomplish this, the U.S. military leaders have been educated to identify the CoGs at the enemy's strategic, operational, and tactical levels of war[c]. Then they must concentrate the appropriate level of their forces at that CoG to obtain a decisive victory that will force the enemy to capitulate. This American way of war is also anchored in the minimization of casualties of both friendly forces and noncombatants, as well as the reduction of collateral damage. The idea of a clean war is routinely born out in the American rules of engagement which exempt targets that have historical, archeological, economic, religious, or political sensitivities. The extensive use of technology to carry out these principles has been embodied into the different strategic visions drafted by the JCS, and the four military services. "U.S. force capabilities will . . . promote quick, decisive operations with the minimal force necessary."[1] Despite the differences of the services and their missions, there are some synergistic thoughts that are common to all of them.

STRATEGIC VISION

"Joint Vision 2010" (JV 2010) is the strategic vision put forward by the Chairman of the JCS, who states that the services should use JV 2010 as a guide to focus their people's

[c] The enemy has different CoGs at the different levels of war. He definitely has one at the strategic level and operational level; however, the idea of a tactical level CoG is debatable since things at the tactical level are so fluid. Therefore our discussion will focus on the operational and strategic level CoGs.

innovations and exploit technologies "to achieve new levels of effectiveness."[2] To facilitate the services' directions, JV 2010 outlines four operational pillars to dominate the battlefield; *dominant maneuver, precision engagement, full-dimensional protection,* and *focused logistics*. These new operational concepts, especially precision engagement, embody the new American way of war. Precision engagement's essence is to "provide a greater assurance of delivering the desired effect, lessen the risk of our forces and minimize collateral damage."[3] This "greater assurance" will be delivered through the exploitation of technologies. One of these technologies mentioned is the long-range precision capability, which "is emerging as a key factor in future warfare."[4]

Since JV 2010 was published in July of 1996, the only service to update its strategic vision has been the United States Air Force (USAF). In November, 1996, "Global Engagement," a Vision for the 21st Century Air Force, was released. "Global Engagement" guides the USAF to use technology as leverage to gain "the ability to hit an adversary's strategic center of gravity directly as well as prevail at the operational and tactical levels of warfare."[5] Like JV 2010, "Global Engagement" has incorporated the new American way of war. Its guidance will greatly contribute to dominating the battlespace with reasonable demands on national resources, while at the same time minimizing collateral damage and the loss of human lives.[6] The USAF will bridge from its strategic vision, "Global Engagement," to operational mission accomplishment through its six core competencies. Of these competencies, precision engagement is the prime strength that will physically effect the enemy's CoG, and is an USAF top priority for the 21st Century. Through precision

engagement, the USAF, with "minimal risk and collateral damage," will focus "selective force against specific targets and achieve discrete and discriminating effect[d]."[7]

These ideas of battlefield dominance through discrete attacks are not a new idea generated from JV 2010. In 1994, the U.S. Army published "Force XXI" as their strategic vision into the next century. "Force XXI's" aim is to "produce overwhelming, decisive, effects-oriented power" through "doctrine, leadership, soldiers, *technology*[e], and information."[8] Through the dramatic technological improvements in target acquisition and precision direct and indirect fires, the Army will expand their battlespace and gain significant advantages over the enemy. Complementary, "Force XXI" proclaims that deep precision strike weapons and smart weapons will allow their combat forces to rain decisive firepower within their greatly expanded battlespace and grant them future maneuver space.[9] The Army's vision, like JV 2010 and "Global Engagement," is also one that embraces the new American way of war by looking to capitalize on technology to decisively attack the enemy.

Like the Army, the U.S. Navy prepared a vision statement before JV 2010 was written. In 1992, "...From the Sea" (FTS) was released, which was the Navy's strategic vision to take them from the end of the Cold War into the 21st Century. "...From the Sea" was further updated and expanded in "Forward...From the Sea" (FFTS) in 1994, to include expeditionary missions and military operations other than war (MOOTW). These strategic visions shifted the Navy from the Mahanian blue water power to a Corbetian regional and littoral expeditionary power. The FTS vision exemplifies this by doctrinally allowing an aircraft

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[d] **Discriminating effects** equate to efficiencies in war through the use of precision weapons, which also limits collateral damage.

[e] Emphasis added by author.

carrier or cruise missile-capable ship to operate independently of the carrier battle group, so it can "provide quick, retaliatory strike capability short of putting forces ashore."[10] This type of action is the perfect example of one of the most important tenets of FFTS, crisis response. Crisis response allows the Navy to give the combatant commander various flexible options, and precise measures to control escalation. Through crisis response in FFTS, the Navy examined and extended its capabilities to contribute to conventional deterrence.[11] Besides the end of the Cold War, this emphasis on conventional deterrence across the full spectrum of conflicts, and away from nuclear deterrence, has come about because modern aircraft and conventional munitions have become much more lethal through accuracy.[12] This point was eloquently put by Rear Admiral Thomas Ryan (USN), Assistant Chief of Naval Operations for Undersea Warfare, when he said ". . . precision-guided long-range munitions can make conventional deterrence a credible policy for the first time. It's the ability to put a precision attack on a target which drives up the credibility of conventional deterrence."[13]

The US Marine Corps has also written a strategic vision statement to guide the Corps into the next century, "Operational Maneuver . . . From the Sea" (OMFTS). In their doctrine, the Marine Corps complements the Navy's idea of conventional deterrence. The Corps's vision states that long-range PGMs, with their increased accuracy, are some of the most lethal weapons of the 20th Century.[14]

Even though the Navy's vision does not openly address minimizing casualties, collateral damage, and national resources (characteristics of the new American way of war), as the other services do, all the services discuss technology-driven precise and decisive attacks. Inherently, these types of attacks using PGMs should be more efficient, cost fewer lives and

munitions, and should be directed towards destroying or isolating equipment and systems versus destroying people. The U.S. military forces have transitioned from a nuclear annihilation-based strategy to a surgical/precision effects-based strategy—"A strategy that can control an opponent without having to destroy him."[15]

This new "effects-based strategy" embraces the new American way of war and the wave of the future. Paul G. Kaminski, Under Secretary of Defense for Acquisition and Technology, stated that "the NATO combat operation in Bosnia—Operation DELIBERATE FORCE—. . . gave us a hint of what combat will look like in the Twenty-first Century."[16] The Secretary of the Air Force, Dr. Sheila E. Widnall, reinforced Under Secretary Kaminski when she compared Operation DESERT STORM to Operation DELIBERATE FORCE.[f] She reiterated that Operation DELIBERATE FORCE was the future of war. "For instance, while only nine percent of all munitions used in [Operation] DESERT STORM were precision guided, in Bosnia, ninety-eight percent of the munitions dropped by U.S. forces were precision guided."[17] In this manner, a war can be more effectively waged by intellectually choosing the proper targets without the highly destructive World War II style bombardments and definitely without massive ground maneuvers. This idea is called the "strategic sufficiency thesis for long-range precision weapons." That is "an enemy nation can be defeated, coerced, or deterred through the precise application of a relatively small number of non-nuclear weapons against a few critical targets whose destruction would force the adversary's government, if not its entire society, to capitulate."[18] This strategic sufficiency idea will not only reduce casualties, but will also reduce costs. This becomes

[f] Dr. Widnall's comparison is not between the operations, but in the kinds of weapons used and the proportions used as compared to each other, i.e. number of PGMs vs. number of dumb bombs.

evident when comparing the bomb droppers of a single mission on a single target of the past with one of Operation DESERT STORM. The Schweinfurt raids of World War II took two raids each consisting of 300 B-17s which dropped 3,000 bombs. To complete the same type of mission during DESERT STORM, it would require only one raid of two F-117s that would drop a total of four precision guided bombs. Not only is the hardware expended a great saving, but so is the number of airmen who are put in a situation where they could possibly be shot down. The Schweinfurt raids required 3,000 airmen, while the Baghdad strike used only two to destroy a single complex.[19]

Because of the emerging ideas of "effects-based strategy," the "strategic sufficiency thesis," the services' strategic visions, and the new American way of war, the combatant commander is beginning to rely on the use of PGMs as the weapon of first choice. Operation DESERT STORM marked the beginning of this technological paradigm shift, where only PGMs were used to destroy key targets in downtown Baghdad to avoid killing civilians or damaging noncombatant buildings.[20] The increased use of PGMs in the Gulf Region has become formalized in U.S. Central Command's (USCENTCOM) Theater Principles which state that PGMs will be required because the region needs a force multiplier to compensate for smaller forces and to decrease the number of casualties on both sides.[21] This thinking is not isolated to USCENTCOM and the Gulf Region, it also exists in U.S. European Command (USEUCOM) who supports the missions over Bosnia-Herzegovina. In a discussion at Aviano Air Base, General[g] Michael Ryan (USAF), the Air Component Commander for Operations DENY FLIGHT and DELIBERATE FORCE, explained to the Aviano F-16 wing

[g] At the time General Ryan was a Lieutenant General.

commander that if his aircraft did not have a precision capability, the wing would not be given any key targets if bombing efforts were required in Bosnia. During the strikes on Ubina Air Field on 10 and 11 April, 1994, the non-precision equipped F-16s were limited to dropping cluster bomb units on soft, out of the way targets. Soon after the Ubina raid, the F-16s were equipped with PGM-capable equipment. When Operation DELIBERATE FORCE was initiated, these same F-16s, who were given a secondary role earlier, not only led the first interdiction missions, but flew more missions than any other unit in the operation. The only difference was their ability to drop PGMs. This technological advance has been called a revolution in warfare by President Bush or at least has "fundamentally changed the way we fight," according to Lieutenant General[h] Buster C. Glosson (USAF), the Director of Campaign Plans for USCENTCOM's air component during Operation DESERT SHIELD/STORM.[22]

THE COMBATANT COMMANDER'S ADVANTAGE

The use of PGMs has definitely changed the way our combatant commanders think about fighting wars. This new approach has taken the warfighter from massed firepower to effects-oriented firepower. It has drastically reduced the number of weapon systems required to complete a mission, and therefore has reduced the number of Americans put in harms way. With this change, one must ask, what have we done to our commanders? Does this unstoppable change give him an advantage, or have the services and the JCS handcuffed the commanders with technology?

[h] At the time Lieutenant General Glosson, was a Brigadier General.

A key word that is mentioned in all the services' vision statements, as well as in JV 2010, is *decisive*. Every commander wants to achieve the most profitable punch which will remove their opponent with one blow, the decisive battle. To win that decisive battle one must identify and then attack the enemy's CoG, the hub from which all his power emanates. This CoG is not only critical in finding those decisive points to attack, but also gives the different components of a joint staff a single focal point at the strategic and operational level. By identifying the CoG, all levels of the joint task force, or unified commander's staff will be able to apply a concentrated effort for a maximum effect on the enemy.

Center of gravity is discussed in all the vision statements, except for JV 2010, as the key to the decisive attack. However, the U.S. Marine Corps, in OMFTS, not only discusses the importance of the CoG, but also describes it in more modern terms. "The center of gravity may be a physical object (a military force, a city, or a region) or a source of supplies or money. More often than not, the center of gravity will be an intangible, essential element of the political and moral forces that keep our enemies in the fight against us."[23] This definition makes the CoG easier to understand, and possibly identify; however, "even with the appropriate center of gravity determined, the [combatant commanders] probably will not have sufficient strength to gain leverage over the enemy center of gravity in one decisive blow."[24] Therefore, it is important for the operational commander to analyze and identify decisive points, enemy strengths, weaknesses, and vulnerabilities in his Commander's Estimate of the Situation. Once accomplished, the commander can decisively attack the enemy's strategic and operational CoG through indirect means. Additionally, constrained resources (number of weapon systems, manpower, or dollars) may also dictate that a

combatant commander use an indirect approach to the enemy's CoG. This is illustrated by the fact USCENTCOM Commander has included PGMs in his Theater Principles to increase effective theater manning.

In this modern age of warfare, the Napleonic (or Clausewitzian) approach to conquering the enemy's CoG, the brutal head-to-head massive army frontal assaults, stands less of a chance of victory both on the battlefield and in the hearts of the people. The more contemporary approach has become a systematic destruction of targets in a certain sequence. The use of PGMs provides the combatant commander a greater chance to target key nodes of a militaristic system. This approach will reduce the amount of effort expended on a CoG and thus minimize the number of strikes in a high-risk area. The Former Secretary of Defense, Les Aspin, conveyed this thought best when he said,

> We've also become more sophisticated about targeting at a time when our adversaries have become more dependent on the kinds of things we can target. We can target communications nodes, power grids, and command and control assets. . . . the collapse of the Soviet Union removed some—not all—but some of the pressure for escalation that accompanies any limited military venture. The limited objectives school has been strengthened as technological developments have improved our ability to achieve compellence[i].[25]

This demonstrates exactly how the United States handled the Iraqi strategic CoG in the Gulf War. The Iraqi strategic CoG was identified as their "national command and control in the sense of Hussein's leadership authority and his means of exercising control over authoritative decisions."[26] (Their operational CoG was the Republican Guard.) The most

[i] For the use in this paper, **compellence** should be understood as a tool the military can use to convince a belligerent to comply with the will of the attacker. The entire study of diplomacy, deterrence, and compellence is not a critical factor for this paper.

direct method to apply that decisive blow to the Iraqi strategic CoG, Hussein's authority, would have been to remove Hussein. This task is very, very difficult to do as the United States proved in Operation JUST CAUSE when it tried to remove Manuel Noriega from a country that the United States had freedom of movement in. Therefore, the best method to attack the Iraqi strategic CoG was an indirect approach through critical vulnerabilities. The United States conducted a detailed analysis of the Iraqi systems and their interdependence. This analysis concluded that the United States could isolate a selected number of critical nodes thus causing Hussein's command authority system to falter. On the first night of Operation DESERT STORM, a coordinated attack by Tomahawk Land Attack Missiles (TLAM) and F-117s with PGMs struck the hardened Air Defense Intercept Operations Center, air defense nodes, command and control facilities, and even suspected locations of country leaders. On that night, 40 per cent of the strategic targets were hit with an 80 per cent accuracy, resulting in the establishment of coalition air superiority, the great complication of Iraqi communication, and the weakening of the enemy's ability to command. This was not accomplished through a lengthy or costly process, but through the "decapitation and intimidation" of the systems.[27]

This systematic targeting using PGMs to indirectly attack a CoG has worked and shows an even greater potential; however, a commander should always keep in mind that a formidable foe will rebuild his important nodes. Even if the nodes cannot be rebuilt, a resourceful and usually successful enemy will find an alternate means of circumventing the destroyed node. The key to preventing this, found in the Basic Aerospace Doctrine of the United States Air Force (AFM 1-1) in the tenets of aerospace power, is *persistence*.[28] If air

power, manned or unmanned, is to be used effectively it must be used with persistence, especially on critical nodes, as it was in Operation DESERT STORM. When using PGMs, the commander must not only think of persistence as simply re-striking a target, but as persistently querying, What continuing *effect* does the strike have on the target and CoG? Is that node still inoperative? If it is, strike another node within the same system—persistence of the system is more effective and efficient with PGMs, than persistence of a single target.

As pointed out earlier in OMFTS, an opponent's strategic CoG is most likely to be an intangible, a moral factor, like the will of the people. Many belligerents have attempted to attack such CoGs, but have usually failed. In World War II, the Nazis attempted the break the British spirit with the Blitz in 1940 and 1941. The bombing efforts, intended to put the fear of death from above into the British people, actually strengthened their resolve to defeat the Germans. History has proven that indiscriminate bombing of populations does little to break the will of the enemy to resist. Moreover, totalitarian and militaristic leaders usually have very little regard for their populous, so bombing the noncombatant will do little to stop the war effort. With the introduction of this fact coupled with PGMs, a better operational course of action would be to attack the military capabilities with the greatest effect on the people versus the will of the people directly. With PGMs, surgical air strikes can precisely remove vital nodes from the enemy causing civil or military systems to deteriorate. Without these systems, confidence in the military to do their job will be lost. This could lead to shock and paralysis within the populace, politicians, and military leaders from which recover will be very difficult, especially if the strikes are continued with persistence. Breaking the will or

effectiveness of the military will lead to the people's loss of confidence in the military and a possible revolt against the government.

The decision to use PGMs to limit casualties is even more important in MOOTWs, such as in the NATO operations in Bosnia-Herzegovina. "Operational Maneuver...From the Sea" highlights this point. Because such operations are usually intertwined with noncombatants, "more precise weapons will allow a significantly greater degree of discrimination. . . . [It] will often be useful in situations where the delivery of tons of high explosive would be counter-productive."[29] The use of PGMs by the combatant commander will be an asset by allowing the use of higher explosive weights while limiting the number of casualties of noncombatants, enemy forces, and friendly forces.

The operational use of PGMs has given the combatant commander the ability to indirectly attack the enemy's strategic or operational CoG through critical vulnerabilities, while being so precise as to limit casualties. The Army, in "Force XXI," relies heavily on simultaneity to bring the full effects of precision operational fires—PGMs. Its goal is to use the "simultaneous attack to create a dynamic capability to extend the battlespace in space, time, and [force]."[30] The Army's vision consists of reducing the enemy retaliation time by the removal of deep critical nodes with precise operational fires, thus reducing the need to physically shape the battlespace. The U.S. Army will accelerate the enemy's defeat through a full-dimensional attack of the enemy's operational CoG. To ensure these precise operational fires achieve their specific objectives, an absolute unity of command is required among the friendly forces for an effective and efficient execution and a focused attack on the enemy's CoG. This focus remains critical since "this simultaneity . . . will blur and compress

the traditional divisions between strategic, operational, and tactical levels of war [and CoGs]."[31] The unity of command is the essential element of simultaneity since the attacks may not be simultaneous, but as long as the strikes are perceived by the enemy to be seamless, the effect will be simultaneous.

The result that "Force XXI" desires in precise, simultaneous, deep fires is to decrease time for the enemy, or increase tempo as a disadvantage for the enemy. This is also addressed in JV 2010. Long-range precision "capabilities will increase the combat power available for use against selected objectives, resulting in enhanced economy of force and a higher tempo of operations."[32] This was truly the case in Operation DESERT STORM when in approximately four weeks, PGMs destroyed 41 bridges and 31 pontoon bridges (built in direct response of the U.S. anti-bridge effort). This proved to be highly effective and efficient when compared to the hundreds of sorties and all the airmen's lives lost attempting to take out the Thanh Hoa Bridge in North Vietnam. The U.S. anti-bridge effort can also be called a success as it helped to isolate and cut off the Iraqi operational CoG, the Republican Guard. The United States reduced the supplies from Iraq to the Republican Guard by 91 per cent—remember all the eagerly surrendering Iraqi soldiers looking for food and water.[33] These new technologies with their simultaneous effect and tempo will allow the United States to act so quickly that the enemy will not be able to react effectively until it is to late.

The high tempo of such a war does come with some downfalls. If the strikes are so fast and so successful, the enemy "may not realize [he is beaten] until he perceives the systematic destruction of his fielded forces."[34] This was the case during Operation DELIBERATE FORCE. The NATO forces, with PGMs, had literally destroyed every large Serbian

munitions storage facility in Bosnia-Herzegovina, and removed every bridge between Sarajevo and Serbia, except for one roadway. The NATO forces had destroyed the Serbian "bullets" and shut down their multiple supply routes before the Serbians had discovered that fact. When dealing with this type of high tempo surgical combat, the commander should consider built-in operational pauses to allow the enemy to fully understand his predicament. This may be the riskiest portion of the operation, or campaign plan, but will most likely be necessary to gain the benefit of effects of PGM fires. Another possible problem that could plague the friendly forces is the use of rapid, changing objectives. When attacking a CoG indirectly, the friendly forces can lose focus on the CoG. If they lose their focus, they have reduced the war to nothing more than targeting.

PROBLEMS OF THE PGM WORLD

One of the largest mistakes a military leader can make, and also one of the easiest, is to fight the last war. When using PGMs, this is a very big trap to fall into since Operations DESERT STORM and DELIBERATE FORCE went so well. Precision munitions are the future. They give the combatant commander, through the JCS's and services' strategic vision, the capability to conduct a war using technology to decisively attack the enemy while minimizing casualties, collateral damage, and national resources. However, PGMs are not the panacea of war. The commander must understand the potential problems he has inherited with this revolution in warfare—intelligence, bomb damage assessment, weather, cost, and their appropriate use. These problems did not go unnoticed in Operation DESERT STORM. In the Government Accounting Office's (GAO) report on the air power in Operation

DESERT STORM, they found, "The effectiveness of air power in DESERT STORM was inhibited by the aircraft sensors inherent limitations in identifying and acquiring targets and by DoD's failure to gather intelligence on the existence or location of certain critical targets and its inability to collect and disseminate timely battle damage assessment (BDA)."[35]

"Joint Vision 2010" recognized these facts also. It calls for accurate targeting when the U.S. joint forces are to use increasingly lethal, direct and indirect fires. The intelligence community needs to build a data base on the enemy's strategic targets; the number of them, their locations, their mobility, and their potential to be hidden. Precision weapons require the highest order of intelligence to be effective and efficient against these targets. The combatant commander has to ensure his theater intelligence connectivity and sources are pushed down to the tactical commander to give him very detailed information of specific targets—exact coordinates, type of target (hardened or soft), if it is in a building, where is it in the building and what else is in the building. The information has to be so exact that it can be programmed into a closed-loop PGM so that the munition will acquire the target after launch and successfully neutralize the target so another strike should not be needed.[36]

The intelligence community has an extremely large task to gather the needed information on a target to ensure a successful PGM strike. If they do not gather this data, the same target will require a second mission, thus negating the efficiency of using PGMs. However, a greater problem exists when a strategic target is not identified at all. The GAO in their paper reported, "the failure of intelligence to identify certain targets precluded any opportunity for the coalition to fully accomplish some of its objectives."[37] For example, before the war, the United States was apprised of only two known Iraqi nuclear development or capability

targets. During the war the United States added seven more nuclear development targets. The alarming post-war truth was that the Iraqis had 68 nuclear weapons development areas. The intelligence community targeted what was known, but their effectiveness was grossly outweighed by the unknown.[38] This is why RADM Ryan advocated that the intelligence community needs to assemble a comprehensive list of targets that the United States would want to "hold at risk" in a potential enemy's country.[39] The targeteers had the luxury of time in Operations DESERT STORM and DELIBERATE FORCE, four and a half months and two years, respectively, to build information for the precision attacks, and even so, some strategic targets were still missed.[40] If the combatant commander is not able to "see" an entire system, the chance of eliminating nodes systematically will most likely fail.

To ensure the combatant commander's use of PGMs is efficient, the intelligence community needs to secure more detailed BDA. In World War II, and even in Vietnam, good BDA could be accomplished by looking at a caved in roof of a building and measuring the square footage of the rubble. With PGMs, the BDA has to include what happened inside the target. The aerial photos of Iraq showed hardened aircraft shelters with a single hole in them caused by 2,000-pound penetrating PGMs. The damage inside was unknown, so the analysts, limited to the photographs, would report, "possible damage to roof."[41] The accurate and timely BDA is the heart of the efficiency of PGMs. If very detailed BDA is not gathered, the combatant commander will increase his costs and increase risk by making unnecessary re-strikes.

Another inherent problem with PGMs is combating weather, which also includes smoke and darkness. "Nearly nineteen percent of the strikes [in Operation DESERT STORM]

attempted by F-117s were adversely affected by weather (misses or no drops)."[42] The commander must remember that the dependence on these new niche weapons, PGMs, presently relies on good visibility. For the laser guided bombs, the bomb and the laser designator must always have an unobstructed view of the target. Cruise missiles need visibility for their terrain mapping navigation function. If the missiles cannot "see" the way-points, they will be lost. Technology is beginning to correct this problem with better sensors on the munition or the augmentation of global positioning satellite (GPS) guidance units. The new PGM families now in the acquisition pipeline are the Joint Direct Attack Munition (JDAM) and Joint Stand-Off Weapon (JSOW). Both are primarily GPS-guided which can produce acceptable accuracy in bad weather.[43]

Some have the belief that fighting a technologically-based war is a war of economics. The more expensive the weapon the more impact one should get from it—the more strategic targets the enemy has the more the war will cost the combatant commander using just PGMs. True, PGMs are expensive weapons. A GBU-12 (a 500-pound laser guided bomb) costs $10,000; however, it can destroy a $1.5 million T-72 tank with a single blow.[44] Under Secretary Kaminski has stepped forward to address this issue in DoD's Seven-Part Munitions Program. "The accuracy of our precision guided munitions is good enough when it takes only two or three weapons to hit an aim point. Our weapon focus now is to preserve this accuracy while reducing cost, increasing standoff range and producing all-weather capabilities."[45] With this initiative, Under Secretary Kaminski will be lowering the cost of these improved weapons, like the JDAM, JSOW, Wind-Corrected Tactical Munitions Dispenser, and Extended Range Guided Munitions. These developments, while increasing

lethality, will remove the cost prohibitions from the commander's problem list, and will exponentially increase his PGM bang-for-the-buck.

The last pitfall the combatant commander must keep in mind is the appropriate use of PGMs. These weapons have the ability to strengthen the operational art of the commander; however, they are not the perfect answer. Cruise missiles, with only a 1,000 pound non-penetrating warhead that cannot be guided after launch, are not a good choice for a hardened target or a highly mobile or hidden target. Aircraft dropped laser guided bombs are not the weapon of choice against an army formation. The commanders must keep all their options open to have maximum flexibility and effectiveness. The best decision made during Operation DESERT STORM was to attack the Iraqi operational CoG, the Republican Guard, directly with B-52s dropping hundreds of dumb bombs. These attacks had more effect on that CoG than any PGM ever could have. It was the most terrorizing bombardment the Iraqis had to endure—it caused paralysis, demoralization, shock and completely dislocated any sense of organization within the Guard.[46] The key to a successful operation is the availability of a mix of strike assets that can bring their effects upon a range of target types, threat conditions, and operational and strategic objectives.

CONCLUSION

The new way of war the United States has evolved into expresses the use of technological leverage to decisively win a war quickly with minimal loss of lives, collateral damage, and national resources. This ideal stands true as the JCS and the U.S. military services publish their strategic visions to carry them from the end of the Cold War into the next millennium.

A common theme runs through all of these strategic vision statements, that is the warfighters need to use innovation and technology to inflict a decisive blow to the enemy's CoG while minimizing cost, collateral damage, and loss of life on all sides of the military operation. Secretary Widnall and Under Secretary Kaminski have pointed out that they see our next war relying heavily on PGMs, as the U.S. forces did during Operation DELIBERATE FORCE. These weapons, according to President Bush, are a revolution in warfare. Precision munitions give the commander the feasibility and acceptability to attack an enemy's strategic or operational CoG indirectly with increased effectiveness and efficiency. The commander can deliver greater firepower effect with fewer weapon systems and fewer follow-up missions. His effective use of PGMs will diminish the number of friendly lives in harms way or lost, and drastically reduce collateral damage (there was no reported collateral damage in Operation DELIBERATE FORCE). The combatant commander's use of these weapons has also greatly affected time, space and force of the military operation through simultaneity and tempo. The commander with the better precision guided munitions definitely possesses an advantage in the battlespace, thus the combatant commander has not been handcuffed or been made a puppet to technology. He has been given greater power through a strategic vision that relies on the technology of precision guided munitions.

Precision munitions are not without problems—PGMs can handcuff the commander if he does not have the key. The key to the handcuffs is to proactively prepare to use precision munitions by fostering and utilizing a robust intelligence community. A community that will select an enemy's strategic targets in advance, and then assemble excruciating details on all possible aspects of these targets. Once the precision strike has been concluded, the

intelligence community needs to gather very detailed BDA. Without this robust intelligence, the effectiveness and efficiency of precision guided munitions will be lost—the combatant commander will just have another dumb bomb.

The idea of precision attack to remove critical nodes from the enemy to such a great extent to force the enemy to capitulate is not a new idea. In 1932 the U.S. Army's Air Corps Tactical School at Maxwell Field, Alabama, professed,

> . . . to single out particular targets whose destruction would of itself bring to a halt an entire industry or series of industries. If a number of such 'bottleneck' targets could be identified and destroyed, it might be possible, with a relatively small force, to bring an enemy's war production to a halt with almost surgical precision, thereby rendering the enemy incapable of further resistance.[47]

The combatant commanders now have the doctrine and technology to fulfill this prophecy.

Notes

[1] U.S. Army Training and Doctrine Command, "Force XXI Operations," Pamphlet 525-5 (Fort Monroe, VA: 1994), 3-3.

[2] John M. Shalikashvili, "A Word From The Chairman," Joint Force Quarterly, Summer 1996, 5.

[3] John M. Shalikashvili, "Joint Vision 2010: Force of the Future," Defense 96, Issue 4, 16.

[4] Ibid., 11.

[5] "Global Engagement: A Vision for the 21st Century Air Force," Lkd. Air Force LINK at "Air Force Home Page," <http://www.af-future.hq.af.mil> (22 November 1996), 1.

[6] Ibid., 3.

[7] "Core Competency: Precision Engagement," Lkd. Air Force LINK at "Global Engagement," <http://www:Af-future.hq.af.mil/21/coret/pret.htm> (22 November 1996), 1.

[8] U.S. Army, 3-3.

[9] Ibid., 4-7.

[10] "...From the Sea," Lkd. Navy Online at "Navy Public Affairs Library Index," <http://www.ncts.navy.mil/navpalib/policy/fromsea/fromsea.txt> (22 November 1996), 5,7.

[11] "Forward...From the Sea," Lkd. Navy Online at "Navy Public Affairs Library Index," <http://www.ncts.navy.mil/navpalib/policy/fromsea/forward.txt> (22 November 1996), 3 - 4.

[12] Richard P. Hallion, "Precision Guided Munitions and the New Era of Warfare," Air Power History, Fall 1996, 15.

[13] Barbara Starr, "Jane's Interview with U.S. Navy Rear Admiral Thomas Ryan," Jane's Defence Weekly, 29 May 1993, 32.

[14] "Operational Maneuver From the Sea," Lkd. JCS LINK at "Service Vision Publication," <http://www.dtic.mil:80/doctrine/jv2010/jvsvc.htm> (22 November 1996), 4.

[15] Hallion, "Precision Guided Munitions . . . ,"13.

[16] "One Target, One Weapon," (Excerpts from Paul G. Kaminski's address delivered at the U.S. Air Force Academy on 2 May, 1996), Air Force Magazine, August 1996, 80.

[17] "Verbatim," (Excerpt from Dr. Sheila Widnall's address at the National Press Club, Washington D.C. on 14 June, 1996), Air Force Magazine, October 1996, 62.

[18] Robert G. Spulak, Jr., "Strategic Sufficiency and Long-Range Precision Weapons," Strategic Review, Summer 1994, 32.

[19] Buster C. Glosson, "Impact of Precision Weapons on Air Combat Operations," Airpower Journal, Summer 1993, 5.

[20] U.S. Department of Defense, Conduct of the Persian Gulf War: Final Report to Congress, (Washington, D.C.: 1992), 131.

[21] General James Henry Binford Peay, III, (USA), "U.S. Central Command Mission Brief," Lecture, U.S. Naval War College, Newport, RI: 17 December 1996.
GEN Peay's permission granted on 3 February, 1997, via telephone conversation with LTC Randy J. Kolton, (USA), Special Assistant to CINCCENTCOM. GEN Peay believes PGMs are an essential weapon in dominating the future battlefield. At the same time, it is also important to have the ability to use conventional munitions, artillery, and forces. Without a complete mix of weapon systems or forces, the combatant commander has limited himself.

[22] Glosson, 4.

[23] "Operational Maneuver From the Sea," 5.

[24] William W. Mendel, and Lamar Tooke, "Operational Logic: Selecting the Center of Gravity," Military Review, June 1993, 4.

[25] Rep. Les Aspin, remarks to the Jewish Institute for National Security Affairs, as quoted in Defense News, September 28 - October 4, 1992, 24.

[26] Mendel, 10.

[27] James H. Patton, "Stealth, Sea Control, and Air Superiority," Airpower Journal, Spring 1993, 57-59.

[28] Headquarters, U.S. Air Force, "Tenets of Aerospace Power," Air Force Manual 1-1, Volume 1, Basic Aerospace Doctrine of the United States Air Force, March 1992, 8.

[29] "Operational Maneuver From the Sea," 4.

[30] U.S. Army, 3-10.

[31] Ibid., 2-9.

[32] Shalikashvili, "Joint Vision 2010," 11.

[33] Hallion, "Precision Guided Munitions . . . ,"10-11.

[34] Edward Mann, "One Target, One Bomb, Is the Principle of Mass Dead?" Airpower Journal, Spring 1993, 42.

[35] U.S. General Accounting Office, Operation DESERT STORM: Evaluation of the Air War, Report to Congressional Requesters (Washington: 1996), 3.

[36] Thomas J. Kapurch, "The Use of Precision Guidance for Weapons: Its impact on the Operational," Unpublished Research Paper, U.S. Naval War College, Newport, RI: 1991, 23.

[37] U.S. Government Accounting Office, 3.

[38] Hallion, "Precision Guided Munitions . . . ,"15.

[39] Starr, 32.

[40] Kapurch, 21-22.

[41] Richard P. Hallion, Storm Over Iraq, (Washington, DC: Smithsonian Institute Press, 1992), 234.

[42] Thomas A. Keaney, and Elliot Cohen, Gulf War Airpower Survey, (Library of Congress, Washington DC: 1993), 225.

[43] Hallion, "Precision Guided Munitions . . . ," 19.

[44] Glosson, 5.

[45] "DoD's Seven-Part Munitions Program," Lkd. DefenseLINK at "Defense Issues," <http://www.dtic.mil:80/defenselink/pubs/di_index.htm/> (22 November 1996), 3.

[46] Hallion, "Precision Guided Munitions . . . ," 17.

[47] David MacIsaac, "Voices from the Central Blue: The Air Power Theorists," in Makers of Modern Strategy, From Machiavelli to The Nuclear Age, ed. Peter Paret (Princeton, NJ: Princeton University Press, 1986), 634.

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